



Australian Bureau of Statistics

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Study of non-response in the Survey of Mental Health and Well Being

The 2007 Survey of Mental Health and Well Being (SMHWB) was a voluntary survey with a relatively lengthy questionnaire and questions of a sensitive nature. The achieved response rate was 60% which caused some concern over potential bias in survey estimates.

Standard practice in ABS household surveys is to attempt to treat non-response through survey weighting. This may entail modelling response propensities and comparing responding sample distributions with other aggregate data such as Census population counts and other ABS survey estimates. Standard weighting typically involves calibration to age-sex demographic benchmarks. The key element that is not directly quantifiable is the correlation between response propensity and characteristics being measured by the survey. Where there are significant correlations between respondent's characteristics and response status, over and above that described by age and sex, then standard weighting does not completely eliminate bias. This is the heart of the non-response problem and can only be fully addressed by obtaining survey characteristics from non-respondents.

In order to provide a qualitative assessment of the extent of possible non-response bias for the SMHWB, a non-response follow-up (NRFU) study was carried out two months after the main survey. The study was designed as a short questionnaire in order to help promote the likelihood of gaining useful numbers of respondents covering demographic and the Kessler Psychological Distress Scale-10 (K10) topics. In addition, after an initial personal contact, the options of CAPI (computer-assisted personal interview) or CATI (computer-assisted telephone interview) were made available. These are different from the mode of collection for the 2007 SMHWB where only CAPI was used. The study was only conducted in the regions of Sydney and Perth. The sample selection was driven by cost considerations. This resulted in a purposive, rather than a random, sample but the interviewers were reasonably spread across different areas of the two cities. The NRFU interviewers were assigned a total of 401 households (229 in Sydney and 172 in Perth), and achieved 151 fully responding households (77 in Sydney and 74 in Perth).

Distributions of the NRFU sample by basic demographic variables were compared with corresponding SMHWB respondents in Perth and Sydney. The NRFU picked up proportionally more males and fewer older persons than the SMHWB. This is not surprising: in household surveys, comparisons of achieved sample distributions with population benchmark data typically show poorer coverage rates for younger persons, males in particular. The NRFU also picked up higher relative numbers of "never married" persons compared to the SMHWB, also consistent with other data sources such as the Census and in part related to the younger age associated with non-respondents.

The unweighted distribution of respondents to the SMHWB and the NRFU across the Kessler Psychological Distress Scale groups by sex and geography and by age and geography were compared. These show male respondents to the NRFU in Perth tend to have higher Kessler distress levels than other males. Perth females in the NRFU also tend to have higher Kessler distress levels than Perth females in the SMHWB. This indicates that there may be differences in the direction and magnitude of potential non-response bias between various geographical, age and sex domains. The level of confidence varies depending on the magnitude of the difference between the respondents and non-respondents and the size (often small) of the follow-up sample contributing to the comparison.

The findings suggest the following:

- the magnitude of bias appears to be small at the aggregate level;
- possible underestimation of prevalence of mental health conditions in Perth;
- possible underestimation of prevalence of mental health conditions for males; and
- possible underestimation of prevalence of mental health conditions for young persons.

The conduct of the study will be reviewed with the aim of developing best practice guidelines on the conduct of non-response follow up studies in household survey collections.

For more information, contact John Martin on (02) 62527006 or john.martin@abs.gov.au.



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Introducing the new employment size item on business survey frames

A new set of employment benchmarks is being introduced to the business survey frames to replace the current Derived Size Benchmarks (DSBs). The new data item will be known as the Stratification Derived Employment Size (SDES), since one of its main uses will be as a size stratification variable, in addition to other uses for frame, provider load and estimation purposes.

The new benchmarks are derived using an item called *number of payees*, which is essentially a total count of payment summaries issued by a business over the course of a year. Number of payees is sourced from the Summary of Payment Summaries form which businesses are required to submit to the Tax Office at the end of a financial year. An adjustment factor is then used to bring it to a level equivalent to employment. This is a change from the methodology used for DSBs, where the numbers were modelled from Business Activity Statement (BAS) wages and salaries information, and only used number of payees when BAS data were not available, as in the case of new businesses. However, BAS wages and salaries information will still be used to derive SDES when the number of payees is not available.

Another feature of the new methodology is the application of consistency checks between the SDES value that has been derived from the number of payees and a corresponding employment benchmark derived from BAS wages and salaries. A large proportion of these inconsistencies is resolved via an automated process. A small proportion of significant inconsistencies that cannot be resolved automatically is manually inspected as part of a quality assurance process for the new benchmarks.

Updating of SDES in the future will be controlled to manage the potential impact on sample rotation and consequently, on relative standard errors of movement estimates. SDES will only be updated subject to the business crossing thresholds set around its current employment size range. Moreover, annual updates to SDES will be spread across four quarters to manage the potential impact on quarterly collections.

It is planned to make a second version of this data item, called the Latest Derived Size Benchmark (LDES), also available on frames. LDES will be updated without any restrictions and as soon as new information becomes available, and will be more useful than SDES for some purposes.

The Methodology Unit in the ABS Victoria Office is currently working on the details of the implementation of the new benchmarks, particularly the update strategy. One of the issues under consideration is whether SDES should be a categorical sizing variable to make it appear distinct from LDES, thereby minimising the risk of any confusion between the two. Other details being investigated include the size group boundaries and appropriate thresholds around these boundaries for updating SDES.

SDES was introduced on the December 08 Common Frame (from which individual business survey frames are drawn) alongside the current DSBs. The current DSBs will be removed from common frames starting with the September 09 Common Frame. The ongoing update strategy for SDES is expected to commence in December 2009. LDES is also expected to be introduced into the common frames starting with the December 09 Common Frame.

For more information, contact Elsa Lapiz on (03) 9615 7364 or elsa.lapiz@abs.gov.au

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QEWS Phase 3 sample design and system re-engineering

This article follows on from an article in the December 2008 issue of *Methodological News*, which described the redesign of the Quarterly Business Indicators Survey. That article described the survey's change of industry classification and scope change to include non-employers (estimated at 15% of economy based on BAS turnover records). The old and new designs of the QBIS survey will run in parallel for two quarters (March and June 2009), and then the new design will be used exclusively from September 2009 quarter onward. This article goes on to describe some of the automated system changes that are being made to improve efficiency by automating parts of the data editing and estimation processes.

We digress briefly to describe QBIS' sister survey, the *Survey of Capital Expenditure*, or known simply as *CapEx*. CapEx is also a quarterly survey that is ran in tandem with QBIS - together they form the Quarterly Economy-Wide Surveys or QEWS. CapEx, like QBIS, is undergoing a redesign to recognise the updated and modernised Australian and New Zealand Standard Industrial Classification (from ANZSIC 1993 to ANZSIC 2006), and an increase in scope to include non-employers for the first time. CapEx surveys the business community's expenditure on building and equipment capital in the past quarter, as well as their anticipated capital expenditure planned in the next 12-18 months. CapEx is run as a separate survey from QBIS due to the differing nature of the financial quantities, and because capital expenditure data can be measured with sufficient accuracy with a significantly smaller sample of businesses.

The redesign work for both QBIS and CapEx has been completed at the time of writing, and the new designs are being implemented over the first half of 2009. One key change is that the QEWS surveys are transferring from the old custom-written QEWS Phase 2 systems to the ABS Survey Facilities (ABS SF), which is the official corporate system. These changes represent an overall improvement to efficiency through the reduction of person-hours required to process survey data in any one cycle, as well as an improvement to the corporate alignment of the systems, thereby improving transparency and comparability with other surveys. The components of these changes are described below.

The ABS Survey Facilities includes a sophisticated imputation engine. Imputation is the process whereby the responses from surveyed units (businesses) that do not respond can be "estimated" by borrowing information from similar units. A typical example is Live Respondent Mean imputation where a unit's value is substituted with the average of responding units of similar characteristics (size, industry, geographical location). Imputation is one of many strategies used by the ABS to compensate for imperfect data quality, though of course the ABS always aims to have high response rates so as to minimise estimation bias associated with imputation.

The QEWS surveys will now use the standard ABS SF imputation tools, which include a selection of 39 imputation methods for different circumstances, and a user-friendly metadata interface which allows ABS officers with relatively little data integration experience to precisely specify and tune their chosen methodology. The standardised format of the metadata allows relatively easy comparison of imputation strategies between different surveys.

Occasionally, our business surveys receive unusually large dollar-value responses for individual units that were thought to be relatively small based on historical information. These outliers can significantly increase the variance (recognised as volatility by some) of our survey results, particularly if the unit has a large survey weight (i.e. the design says it represents a large number of other businesses not surveyed for the sake of calculating estimates). One way to treat such outliers is through winsorisation, which decreases a unit's contribution to estimates. Winsorisation comes at the cost of a mild downward bias on estimates, but this is a necessary compromise to limit the amount that estimates vary from quarter to quarter due to unusually large units. The QEWS surveys will now use the full version of the ABS SF winsorisation facility.

Lastly, QEWS will now use the full suite of standard error calculation engines of the ABS SF. Under the previous QEWS design, standard errors for QEWS surveys involved the running and interpretation of a specialised program, which was a cumbersome manual task particularly if repeats were requested. The new system will be able to produce standard errors as part of the existing "data refresh" processes, thereby improving efficiency. The ABS SF standard error calculation engine uses the highly flexible bootstrap replication technique, developed by the Statistical Services Branch (SSB) in MDMD. Bootstrap replication is adaptable to a wide variety of survey designs, and can be applied with little knowledge of the internal working of the survey, and hence is an ideal choice for a corporate system. The automation of standard error calculation for QEWS also opens the possibility of running multiple draft refreshes of standard error estimates to aid in data editing while it is still being finalised.

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'Making Quality Visible'- an update

In the September 2007 edition of Methodological News, we reported on the Making Quality Visible (MQV) initiative that was underway in the ABS. This article provides an update of the progress that has been made since then on various aspects of the MQV initiative.

ABS quality framework

In December 2007, the ABS quality framework was updated to include an additional dimension called "Institutional Environment". It was felt that due to the increasing number of statistics which are sourced from administrative data, particular note should be made as to the source of this information when reporting on quality to allow informed decision making to occur. The addition of this dimension to the quality framework brings the total number of dimensions to seven, which are: Institutional Environment, Relevance, Timeliness, Accuracy, Coherence, Interpretability and Accessibility. Work is underway to compile a document for external release which describes the ABS quality framework in detail.

Quality declarations

Quality declarations (QDs) are statements reporting on the quality of an ABS statistical release using the seven dimensions of the ABS quality framework. Quality declarations are written specifically for web-based dissemination: they are short and brief statements about the quality of the statistics being viewed. They are not comprehensive and are not intended to replace other supporting quality information that is available in the form of Explanatory Notes, Technical Notes and Concepts Sources and Methods, to name just a few. Quality declarations were designed to be more visible than other explanatory material on the website and as a result are intended for use as a brief introduction of the quality of the statistics whilst providing links or advice to more detailed information.

In 2007, the ABS committed to the creation and release of QDs accompanying statistical products on the web starting in January 2008. Since then, the ABS has widened its scope for QDs to be included from January 2009 onwards for compendium publications and for Confidentialised Unit Record Files (CURFs).

Quality statements for the Council of Australian Governments (COAG)

The Council of Australian Governments (COAG), in a Heads of Treasury circular (2008/02) "Implementing the new national performance reporting framework", mentioned the use of the ABS data quality framework for creating performance indicators:

"On the 3 July 2008 the Council of Australian Governments (COAG) agreed to a new national performance reporting framework to underpin the new framework for federal financial relations....Agencies responsible for compiling the performance indicators will prepare a quality statement for each, based on the Australian Bureau of Statistics' Quality Framework."

The ABS will be playing an active role in the adoption and use of the ABS quality framework for assessing performance indicators using quality statements. Along with supplying the quality framework, the ABS will recommend core content that is required in the construction of performance indicators.

Quality reviews

Quality reviews are a new concept within the ABS that were first piloted in 2008. The concept for quality reviews is based on a similar program of quality reviews in Statistics Sweden.

Quality reviews are an intensive review of a collection or a process, and are conducted over a short period of time (usually five working days). The quality review is conducted by a team of three independent reviewers from methodological, system and operational backgrounds, and the findings of the review are provided to the area for which the review is being conducted, so that they can improve their processes where possible. Quality reviews were conducted in 2008 for the Retail Trade and International Trade Statistics areas.

For more information on this work, please contact Melissa Gare on (02) 6252 7147 or melissa.gare@abs.gov.au, or Narrisa Gilbert on (02) 6252 5283 or narrisa.gilbert@abs.gov.au.



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Developments in social capital measurement

Developing measures of social capital across individuals and communities has attracted a large amount of attention and policy interest. To assist such development, the ABS released in 2004 a comprehensive Social Capital Framework (cat. no. 1378.0) whereby social capital resources are classified into a number of network attributes, including network qualities (trust, efficacy, active involvement in groups, friendship), structure, transactions and types.

The enumeration of the 2006 General Social Survey (GSS) provides an important opportunity to explore a range of measures of social capital and see how they are related to each other. A research paper which explores measures of low social capital based on the framework above, and relies on GSS data, will be released in late March 2009. The paper describes the GSS social capital data items and the viability of using these person-level items to create composite measures of social capital.

The social capital data items from the 2006 GSS investigated in the paper involve various measures of trust, feelings of safety, feeling able to have a say on important issues, frequency of contact with ex-household family and friends, and the proportion of friends with similar characteristics. The paper analyses these data items to see how these items relate to each other, and provides some insight into how they could be meaningfully grouped together.

To explore measures of social capital, the paper addresses the following research questions:

- What is the incidence of, and associations between, the social capital items?
- Are there unobserved factors that explain the variance across the social capital data items?
- Is it feasible to produce meaningful composite items from the dimensions of social capital?
- How do the social capital measures vary across demographic groups?

The paper first reports the incidence of the GSS social capital data items, for the total (surveyed) population and by the subgroups: sex; age groups; time in current dwelling; country of birth (Australia and overseas); and remoteness of usual residence (major cities and regional/remote). Binary variables were extracted from these data items in order to create measures of 'low' social capital. Given that social capital theory suggests that there is more than one dimension of social capital, factor analysis was used to explore these underlying dimensions.

The results presented in the paper show that, although a single measure of social capital is useful in summarising the patterns across the population, there is sufficient variation to warrant a number of dimensions of social capital to be analysed separately. An upcoming paper will test the validity of the composite measures created in this paper in terms of their associations with aspects of well-being, and whether these associations remain after controlling for demographic characteristics.

For more information on this work, please contact Jonathon Khoo on (02) 6252 5506 or jonathon.khoo@abs.gov.au, or Jenny Myers on (02) 6252 6679 or jennifer.myers@abs.gov.au

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Embedded experiments in repeated and overlapping surveys

Statistical agencies make changes to the data collection methodology of their surveys in order to improve the quality of the data or to improve the efficiency of the collection process. For cost reasons, it may not be possible to reliably estimate the impact of such a change on survey estimates or response rates, without conducting an experiment that is embedded in the survey which involves enumerating some respondents using the new method and some under the existing method.

From October 2003 to August 2004, pen-and-paper interviewing (PAPI) was replaced by computer-assisted interviewing (CAI) in the Monthly Labour Force Survey (LFS). There was concern about the impact that changes to the data collection method would have on LFS estimates. To address this concern, some effort was taken to answer the following methodological questions: how should CAI be phased in; how should the CAI effect be estimated; and how should the uncertainty in the estimated CAI effect be measured? The methodological developments were required to account for the LFS's multi-stage design and its rotation pattern which gives a high degree of sample overlap from month-to-month. These methodological issues needed to be balanced with operational constraints, such as the constraint that an interviewer could not use both CAI or PAPI in a given month, and managerial considerations, such as managing the risk to the LFS series if the CAI effect were large.

Previous embedded experiments in the literature are used for ongoing and overlapping surveys where maintaining a time series is important. However, the experimental designs and the estimation methods that have been developed assume there is only a single time point. The approach developed as part of the above project has a number of advantages over previous approaches: it exploits the correlation between the overlapping samples to improve estimates of data collection effects; data collection effects are allowed to vary over time; estimation is robust against incorrectly rejecting the null hypothesis of no data collection effect; and it allows for a new data collection method to be introduced over time.

A paper describing the methodology and the practical experience gained during the introduction of CAI will soon appear in the *Journal of the Royal Statistical Society Series A*. For more details, contact James Chipperfield on (02) 6252 7301 or james.chipperfield@abs.gov.au.

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Analysis of probabilistically linked data: application to the simulated Statistical Longitudinal Census Dataset

As has been described in previous MDMD newsletters, the key feature of the Census Data Enhancement project is to create a Statistical Longitudinal Census Dataset (SLCD) based on a random sample of 5% of person records from the 2006 Census. These will be linked to person records from 2011 and subsequent Censuses without using name and address as linking variables. The SLCD will provide a substantial opportunity for longitudinal analysis to see how people and their families or households change over time, while maintaining the ABS' strong commitment to the confidentiality of its Census respondents. Since a unique person identifier will not be available, some links will be incorrect, so some linked Census records will not correspond to the same individual.

The ABS has conducted a quality study to assess the feasibility of forming the SLCD in this way and its likely quality. Within a short window, during which the 2006 Census data were being processed, name and address were available for both the Census and Census Dress Rehearsal (CDR). *Gold standard* person-level links were formed using names, address, mesh block and selected Census data items and were assumed to be without error. To simulate the linkage method for the SLCD, *Bronze standard* person-level links were formed using only mesh block and selected Census data items (i.e. no names and address). Differences between Bronze standard and the Gold standard estimates are assumed to be due to errors in the Bronze standard links.

In the previous issue of *Methodological News*, mention was made of fitting generalised linear models to probabilistically linked data. A method was developed by Professor Ray Chambers, of the University of Wollongong, for removing bias in analysis due to inexact linkage. This method was implemented as part of the above quality study. While the method did in fact reduce the bias due to incorrect links, a larger source of error was due to non-links.

A non-link arises when a record on one file that could have been linked to its existing counterpart on the other file was not linked at all. A non-link would occur if there were insufficient information for a reliable link to be made. If the characteristics of non-links are unusual in some way, estimates obtained from the Bronze-linked data may be biased. This concern is analogous to the concern of record non-response in sample surveys and is based on substantive reasons. For example, people aged under 20 years were under-represented in the Bronze linked data because there were relatively few useful linking variables. For instance most are never married, do not have post-school qualifications, many have not yet completed school and those who have may not have a steady field of employment yet. Future work is focusing on reducing the error due to non-links.

For more details, contact James Chipperfield on (02) 6252 7301 or james.chipperfield@abs.gov.au.

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Web survey 'guru' visits the ABS

A well-known and widely published expert in the design and implementation of Web surveys as well as other areas of data collection research visited the ABS in February. Mick Couper, a Research Professor in the Survey Research Centre, Institute for Social Research, at the University of Michigan, visited the ABS to share his experiences of Web survey development. He was in Australia to run a workshop on 'Designing Effective Web Surveys' as part of the Australian Market and Social Research Society (AMSRS) Summer School.

Mick's visit was an excellent opportunity for the Data Collection Methodology (DCM) Section and other questionnaire design experts and Web form enthusiasts to learn from his practical experience in the design and implementation of Web surveys. A welcome lunch was followed by a brief overview of electronic forms in the ABS and a presentation by Mick about representational issues in Web surveys (e.g., sampling, coverage, non-response, mixed-mode, opt-in panels, etc.). Mick shared his views on topics such as progress indicators, alignment of radio buttons, use of word substitutions, accepting answers in a preferred format, presentation of error/alert messages and tailoring response enhancing techniques for Web surveys.

Much of the discussion on the above topics reinforced previous research and ideas. Some of the key lessons learnt included that progress indicators rarely have a positive affect on the respondent experience or survey response, having a 'back' button in Web surveys leads to more honest reporting and forms design experts should follow established Web form conventions, even when this goes against paper form design best practice.

Meeting with Mick was particularly relevant for the DCM Section, as it is currently finalising a Web form literature review and developing the ABS' Web Form Standards for statistical collections, following on from its work with Web Publishing on user Web survey standards. For some design issues, the most recent relevant experiments are not yet published, so Mick's input on these issues was invaluable in terms of developing a best practice guide for the ABS.

For more information about either Mick's visit, the Web forms literature review or development of the ABS' Web Form Standards, contact either Kettie Hewett on (02) 6252 7295 or kettie.hewett@abs.gov.au, or Jennifer Mitchell on (02) 6252 7783 or jennifer.mitchell@abs.gov.au.

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Research being undertaken on macroediting

Editing is the activity aimed at detecting, resolving and treating anomalies in data to help make the data 'fit for purpose'. Whereas microediting involves the editing of collection inputs such as unit records (i.e. microdata), macroediting involves the editing of collection outputs such as estimates, ratios of estimates, and standard errors (i.e. macrodata). Note that some collections have more complex collection outputs such as indexes, medians, or composites of estimates (as in the National Accounts) which must also be macroedited. For simplicity, this article will refer to all collection outputs as 'estimates'.

The Statistical Services Branch is currently undertaking researching methods for the efficient detection of anomalous estimates for macroediting. The aim is to extend the micro significance editing approach to macroediting where a measure of significance is used to develop a 'macro significance score'. The size of the score indicates how anomalous an estimate is considered, where higher scores indicate estimates which are considered more suspicious. Estimates can be ordered in descending score size to create a ranking. The higher the score, the more likely it is that the estimate and/or standard error may have been affected by important processing or estimation errors, important data errors, outliers; or that it is correct but requires justification. The scoring and ranking system will allow the macroediting workload to be managed where the manager can balance the amount of macroediting with the time and resources available for macroediting. This will assist macroeditors to achieve maximum benefit for their macroediting effort and, hopefully, free up macroediting time for the more complex and difficult problems.

Although macro significance scoring is a fairly simple idea, it has the advantage that it uses the same concepts used for micro significance editing such as the calculation of scores for estimates; the ranking of estimates by score size; the application of editing cut-offs (i.e. an editing cost-benefit analysis); and the identification of anomalous estimates. The scores are based on comparisons of estimates and standard errors with the expectations of them. This will usually involve comparing current estimates with previous estimates (possibly adjusted for trend or seasonality) and achieved standard errors with desired (or design) standard errors. In this case, the previous estimate is used as the expected estimate and the desired standard error is used as the expected standard error. It is envisaged that the user will be able to choose to use scores based on estimates only, scores based on standard errors only, or scores based on a combination of both. Cut-offs can be optionally used to choose a set of anomalous estimates for further investigation (it is expected that most cutoffs will be chosen interactively).

A variation of this approach can be applied to estimates where no expectations of them exist. In this case, the scores will most likely be based on the contribution of estimates to higher level estimates (where the higher level estimates are aggregations of the lower level estimates). For example, State by Industry estimates can be ranked in terms of their contributions to both State and Australian estimates. This could be of advantage when there are many lower level estimates for each item and many items.

If macro significance editing is found to be a useful addition to the wider set of macroediting tools for business surveys, it is expected that the method will be added to the Significance Editing Engine functionality. This will bring together similar micro and macro significance editing concepts and system infrastructure into the one tool. A simple test version of one adaption of the above ideas, called "Hierarchical Macroscores for Movements" (HMM), has been created. This prioritises lower level movements (such as State by Industry) in terms of their impact on two higher levels (such as State and Australia). HMM has been tried by a few surveys and initial indications are that it is very useful.

Looking some way ahead, it is possible to combine the scores with graphs such as scatterplots and scatterplot matrices where the anomalous estimates and standard errors can be displayed using symbols or colour coding. The macroeditor will be able to 'see' the result of the score cut-offs. With interactive graphics, the (objectively-chosen) anomalous estimate selections can be manually modified by the macroeditor thus incorporating the subjective component of macroediting. Ultimately, the user could click on points and drill down to more detailed decompositions of the estimates.

For further information contact Keith Farwell on (03) 6222 5889 or keith.farwell@abs.gov.au.

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